

THE ENERGY STATE?

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In the '80s, the question was Beta or VHS?

Today, the question is fuel cells or ethanol, wind power or geothermal, nuclear or methane?

With gas prices soaring, interest in alternative fuels has heightened, spurring the race forward for the next generation of energy sources.

And Idaho is front and center in this race.

Idaho is shaping up to be a testing ground for numerous renewable energy technologies. That's not surprising, considering the state boasts a variety of elements that make it a viable laboratory for the next step in power generation. Those elements include:

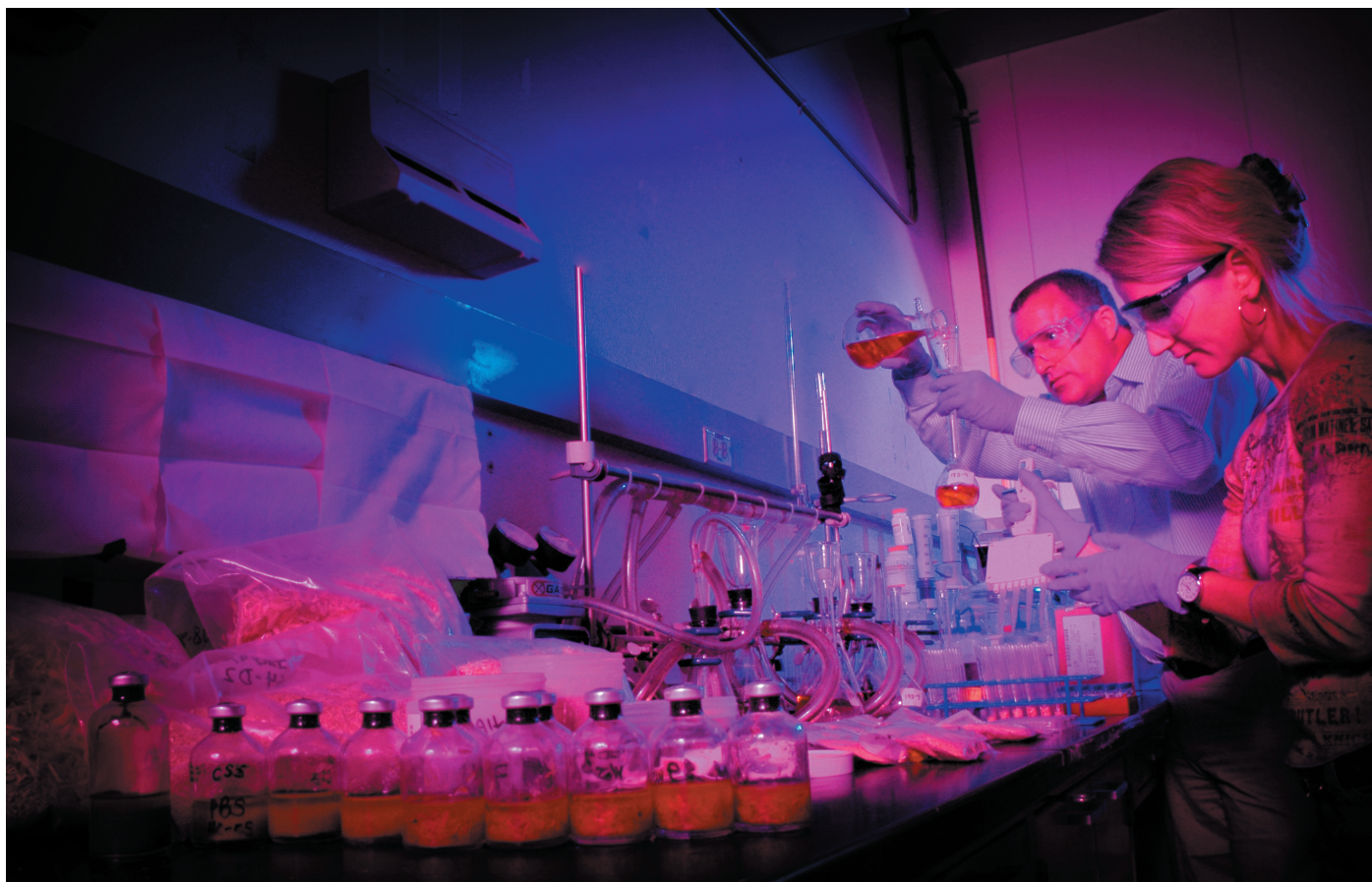
- The Idaho National Laboratory, one of just a handful of national labs, which is not only dedicated to a new nuclear mission, but continues with several other alternative energy projects.
- Land dedicated to agriculture, which is being looked to for the production of crop-based biofuels, such as ethanol and biodiesel.
- A significant dairy industry, which is the focus of several biofuels projects that convert manure into methane.
- A strong and proven geothermal energy potential, and a reputation for being a state with some of the most commercial geothermal usage in the nation.
- A ranking of 13 in the nation for its wind power development potential, with specific areas considered highly suitable for wind development projects.
- The plan to develop a Center for Advanced Energy Studies in eastern Idaho, which is expected to become a world center for researchers and students.

Additionally, there is a proliferation of companies and university research focused on additional areas, such as fuel cells, low-power batteries, and electric car technologies.

So, is Idaho on its way to becoming "the energy state?" Could the next world standard for power generation be developed in Idaho?

Karl Tueller doesn't think that idea is too far fetched. He certainly believes the state will play a role.

"Power and energy is considered one of the state's core competencies in the technology sector," said Tueller, executive director of



Left: Scientists in the Biological Sciences group of the Idaho National Laboratory in Idaho Falls run tests on biomass materials to determine optimal compaction for cost-effective transport, while still preserving quality. Above: INL's Corey Radtke and Heather Silverman prepare samples to evaluate biomass conversation and quality preservation options. Photos courtesy of INL

Idaho's Office of Science & Technology. "With power and energy named as one of just three main core competency areas identified by the state, that means we not only recognize our expertise in this area, but we are also looking to expand our opportunities."

Just months after the Governor's Science & Technology Council ratified those core competency areas earlier this year, the state's three largest universities agreed to promote development of these areas in research emphasis on campus.

"By honing our focus on key areas of expertise, we will be better able to compete in a worldwide market," said Tueller.

One critical development in 2005 has been the designation of the Idaho National Laboratory as the nation's lead nuclear energy research facility. With that designation, the INL has been authorized to develop and launch a new generation of advanced nuclear energy systems.

"With growing concerns about global warming as well as the stability and long-term availability

of fossil fuels, the United States and many other nations are, prudently, focusing greater attention on nuclear energy," said INL Laboratory Director John Grossenbacher.

Our (INL) energy research portfolio encompasses bioenergy, geothermal, wind, hydro, fossil, hydrogen, alternative-fueled and hybrid-electric vehicles, energy conservation and more...

INL is one of only 10 multi-program national laboratories in the country owned by the U.S. Department of Energy. Geographically, the Idaho lab is the largest, encompassing nearly 570,000 acres and concurrently serving as a national environmental research park.

In part because of its size, and its more than 3,300 scientists, engineers and support personnel, INL focuses on a wide range of energy issues. The site is the leading federal lab in basic

nuclear science, and has expertise in nuclear reactor research and development.

Nuclear isn't the only type of energy being developed in the eastern Idaho desert laboratory. The INL's research goes far beyond the atom, said Bill Rogers, INL's chief research officer.

"Our energy research portfolio encompasses bioenergy, geothermal, wind, hydro, fossil, hydrogen, alternative-fueled and hybrid-electric vehicles, energy conservation and more," said Rogers. "From developing integrated power systems for use on isolated islands to mapping wind, geothermal and hydropower resources in the United States, this laboratory has made significant broad-spectrum energy research contributions over the years."

The lab has what is called a Critical Infrastructure Test Range, which allows for the nation's communications and power systems to be tested to determine how safe they are from terrorist attacks or other problems. It also conducts targeted research and development for DOE's fossil energy, and energy efficiency and renewable energy



Above: A research project between Boise State University and private Eagle-based firm TenXsys is studying how to capture the energy of movement – as in flying birds – to recharge batteries. The research is expanding to use human movement to power devices such as cell phones. Photo courtesy of BSU

program, and is one of three lead laboratories for the DOE geothermal program.

It is the lead laboratory for engineering support to the DOE national hydropower program where it studies everything from fish mortality to plasma technologies and biotechnology.

INL continues projects such as the development of an alternative fuels bus used in national parks and capable of operating in heavy snow conditions. The 16-32 passenger bus was developed to be low-emission and fuel-efficient, with future uses ranging from school buses to community transit vehicles. Eventually, they will be manufactured using several optional engines, to allow use of alternative fuels like natural gas, propane, ethanol and biodiesel.

"Biomass is one of Idaho's and our nation's most important energy resources," said INL's Rogers. "It's been the largest renewable energy source in the U.S. every year since 2000, and stands out as the only renewable alternative for conventional gasoline and diesel as a transportation fuel. To help the nation more fully realize the potential of biomass, INL researchers are involved in a wide range of research from process and system design, through biochemical and biomaterials studies, all the way through to demonstration of full-scale feedstock assembly and pre-processing facilities."

The development of biomass fuels has tremendous potential for Idaho's rural communities, since investment into agriculture-based fuels would bolster areas outside the urban centers.

This type of economic focus is a win-win for Idaho," said Tueller. "We can see economic gains spread more evenly around the state, providing jobs in rural areas. And there's the potential of incorporating one of Idaho's legacy industries – agriculture – into one of its newest industries, and seeing a worldwide benefit."

University of Idaho has broad programs and projects invested in the energy sector.

The university becomes a focal point for the worldwide utilities industry each year during its annual course for utility executives, the only course of its kind held in North America. Topics in the course have ranged from environmental collaboration to globalization to standard market design.

This fall, University of Idaho hosted a Sustainable Transportation Conference that brought national experts discussing a host of existing technologies, from anaerobic composting toilets to green architecture to mini-automation that conserves energy.

That conference featured a VW BioBug and a Dodge Ram truck, both fueled on 100 percent biodiesel, which were university projects. Additionally, it also showcased a student built shoebox-sized car that uses hydrogen fuel cells as a power source.

A number of research projects are underway in various areas of campus. One UI chemist, Gus Davico, has identified a better way to convert methane from natural gas to methanol. The discovery could lead to safer, less expensive

alternatives to transport natural gas to consumer centers and to provide feedstock for the chemical industry.

"We found a catalyst that is environmentally friendly; one that catalyzes the reaction at very low temperatures," said Davico, who works with several student researchers in his lab on the project. "It's quite efficient, and it's based on iodine."

Other researchers in California and the Netherlands had previously identified iodine as a possible catalyst, but the work at University of Idaho is the first to move beyond theory and into the development of instrumentation for the study.

The Microelectronics Research and Communications Institute of UI develops technologies to power devices in new ways, and includes work in battery development, intelligent control and neural networks. One project includes developing a way to enable autonomous underwater vehicles to work as a unit and adapt behavior in changing conditions.

Researchers are using both fuzzy logic and system theoretic approaches and in-water testing is being done at naval facilities in Bayview, Idaho. Both the Office of Naval Research and the Department of Defense sponsored the project.

Idaho State University hosts a number of ongoing energy-related projects. Those projects range from a study of wind energy applications to either supplement or replace natural gas usage on campus to studies of worldwide test facilities for gas-core nuclear reactor component testing.

ISU graduate students take advantage of proximity to the INL by researching the possibility of having the Idaho National Laboratory's Advanced Test Reactor available for component testing to working with the INL in studies on the pebble bed gas-cooled high temperature reactor.

At Boise State University, there are a number of wind projects underway and the university hopes to soon receive funding to establish a BSU Center for Wind Energy in early 2006.

One of the oldest ideas around – bottling the energy of movement – is being turned into reality through cooperative research between BSU mechanical engineering professor John Gardner and local engineering firm TenXsys Inc.

The partnership strives to convert everyday motions like walking into energy to power cell phones and other devices. The research team is using birds in an effort to harness the birds' own motion to prolong battery life on telemetry collars, or tracking devices used by wildlife experts. If the bird's motion can be used to charge the collar battery, then small, lighter batteries could be used, resulting in entire new areas of research on smaller birds and animals.

"We could actually do lifetime studies on all kinds of birds if we are successful in harnessing the bird's energy," said Frank Risky, TenXsys president.

And if the bird research works, then it's a short step to human applications, the research team believes.

"Eventually we may be charging our cell phones just by carrying them around all day," said BSU's Gardner.

New projects in private industry continue to be unveiled and funded in Idaho.

This fall, Idaho Synthetic Energy Inc. received a \$200,000 renewable energy grant from the U.S. Department of Energy to create a hydrogen production facility in southwestern Idaho.

The company will create hydrogen with electricity generated by wind turbines in Elmore County, Idaho, a short distance from the first commercial wind farm. The hydrogen fuel produced will be used primarily for industrial purposes throughout the region.

Another wind power operation also received federal funding this fall—\$18,000 from the USDA. The operation involves a small electricity-producing wind turbine in Owyhee County.

IdaTech, the fuel cell subsidiary of Boise-based IdaCorp, has seen the popularity of its products rise with expanded contracts with the U.S. Navy in cooperation with partner Hoku Scientific Inc. The U.S. Navy is demonstrating the functionality of the fuel cell systems and is now calling for Hoku Scientific and IdaTech to manufacture 11 demonstration-ready fuel cell systems, and to demonstrate 10 of them for a year.

"There's just no question Idaho has core expertise in the area of power and energy," said the state's Tueller. "Now, it's just a matter of how we can leverage that expertise to help the state, and the future of power generation for our nation and the world." **IQ**

What's a core competency?

"Power and energy" is considered one of Idaho's technology core competencies as determined by a report issued earlier this year by the Governor's Science & Technology Advisory Council.

The report examined areas where Idaho has both expertise and future opportunities for economic growth.

The core competency areas in the report are:

- Imaging – relating to printing, digital photography, medical equipment, home entertainment systems, and monitoring devices.
- Power and Energy – relating to the pursuit of dependable, affordable and environmentally sound production and distribution of energy.
- Ag/Biosciences – the research and development and management of biologically based organisms and their ecosystems.
- Nanoscience and New Materials – this emerging area relates to the research, development, manufacture and analysis of materials near the atomic/molecular level.

A full report on Idaho's areas of expertise is at www.technology.idaho.gov.

Five "cool" Idaho technologies in the power and energy sector

1. Intrepid Technologies, based in Idaho Falls, creates electricity from cow manure. The company develops, builds and operates facilities for the production of biofuels, which are combustible fuels (methane, biodiesel, ethanol and hydrogen) derived from organic matter. www.intrepid21.com.
2. Bully Dog Technologies, located in Aberdeen, makes a technology that gives more horsepower to diesel engine vehicles. www.bullydog.com
3. The Idaho National Laboratory in Idaho Falls is developing space batteries for the January launch of the mission to Pluto. Learn more at www.inl.gov
4. ECO Research, in Nampa, makes an energy-savings device that calculates real-time climate conditions to deploy sprinkler systems. www.ecoresearch.com
5. Telemetric Corporation, in Boise, makes wireless communications systems for utilities. The technology enables utilities to remotely detect and diagnose problems and more efficiently respond to outages and problems. www.telemetric.net

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